Appendix E
Pavement Type Selection Policy

KENTUCKY TRANSPORTATION CABINET
PAVEMENT TYPE SELECTION POLICY
January 24, 2006

CHAPTER 1

INTRODUCTION

1.1 Type Selection Goal

The Kentucky Transportation Cabinet (KYTC) has determined that the primary goal of pavement type selection is to provide well performing, durable, safe and cost-effective pavements.

1.2 Purpose

The objective of this document is to define the process that the KYTC will use to determine Pavement Type Selection for major projects. This document addresses the procedural approach for type selection determination and defines the responsibilities of each group that is involved in the pavement type selection process. This document also further defines the technical processes that are to be used for pavement type selection. These include, but are not limited to, Pavement Design Procedures, Primary Engineering Factors and Cost Analysis.

1.3 Scope

1.3.1 Interstates

This policy applies to projects on the Interstates that are new construction, reconstruction, major widening, or include pavement rehabilitation. Major widening includes projects that add additional traffic lanes to the current system. Pavement rehabilitation projects are defined as projects greater than one (1) mile in length that include more than 1 ½" of grade change or greater than 2" of pavement milling.

1.3.2 Parkways and all other NHS Routes

This policy also applies to projects on the Parkway system and all other National Highway System (NHS) projects greater than four (4) lane-miles in length that are new construction, reconstruction, major widening, or include major pavement rehabilitation. Major widening includes projects that add additional traffic lanes to the current system. Major pavement rehabilitation projects are defined as projects that include more than 4" of new pavement.

1.3.3 Other Projects Off the NHS

This policy also applies to all new construction, reconstruction, and pavement rehabilitation projects over four (4) lane-miles in total length that have:

1) Greater than or equal to four (4) inches of new pavement
and,
2) Greater than or equal to 5,000 ADT (current); OR
3) Greater than or equal to 5,000,000 ESALs (20-yr forecast)

1.3.4 Intersections

Intersections can present situations that require special attention. Intersections are to be analyzed on a case-by-case basis by the designer or project team. Type selection for intersections may be brought to the Central Office Pavement Branch at the discretion of the designer or project team.

1.4 General

The Commissioner of Highways will administer this policy, with the approval of the Federal Highway Administration (FHWA) on projects where federal aid funds are involved. The Pavement Branch of the Division of Highway Design will provide technical assistance, advice, training, and support.

Any request for change in pavement type on projects covered by this document once a project has been awarded for construction must come before the Commissioner's Office for approval.

1.5 Background

This document will supercede the original Pavement Type Selection Policy that took effect on October 29, 2003. This document will take effect immediately upon approval by the KYTC Commissioner of Highways and the FHWA Kentucky Division Administrator.

CHAPTER 2

ORGANIZATION AND RESPONSIBILITIES

2.1 Commissioner of Highways Office

The Commissioner of Highways will have primary approval authority for type selection on all projects covered under Section 1.3 of this document.

2.2 Division of Highway Design Pavement Branch

The Pavement Branch will be responsible for developing pavement designs and engineering analyses for all projects on the NHS and all other projects that fall outside of the scope of the *Pavement Design Guide* ($\geq$20,000,000 ESALs, $\geq$15,000 ADT, or $\geq$20% Trucks). The Pavement Branch will submit a type selection report on these projects to the State Highway Engineer and the Commissioner of Highways for their consideration and approval. The Pavement Branch will maintain the pavement design records and documentation concerning project decisions for these projects for a time period that exceeds the life of the pavement design.

The Pavement Branch will also be responsible for:

1. Recommending all policies, manuals, and guidelines concerning pavement design and rehabilitation.
2. Reviewing District Project Team recommendations and providing concurrence/non-concurrence documentation to the Commissioner of Highways for all projects listed under Sections 1.3.3 and 1.3.4.
3. Providing technical support, advice, training, and assistance to District personnel involved in development of project scopes, design, and preparation of plans.
4. Providing technical support and pavement type selection recommendations to the State Highway Engineer and the Commissioner of Highways.

2.3 District Offices and Project Teams

The Districts will be responsible for all project-related design activities including pavement design and engineering analysis for projects that fall under the scope of the *Pavement Design Guide* (<20,000,000 ESALs, <15,000 ADT, <20% Trucks, and off the National Highway System).

Districts will be responsible for maintaining pavement design records and documentation concerning project decisions for a time period that exceeds the life of the strategy.

2.3.1 Project Team Responsibility

The Project Team will develop a type selection report on all projects that fall under the *Pavement Design Guide* covered under Section 1.3.3. The Project Team will transmit the report to the Division of Highway Design Pavement Branch under the signature of the Branch Manager for Pre-Construction.

2.3.2 Other Project Responsibility

The Project Team will recommend for approval type selection for all projects not covered under Section 1.3 of this document. The Branch Manager for Pre-Construction will approve type selection for these projects recommended by the Project Team.

2.4 University of Kentucky Transportation Research Center

The Transportation Research Center at the University of Kentucky will work with the Pavement Branch in a research and technical advisory capacity. They will be utilized as consultants on pavement design and type selection issues.

CHAPTER 3

PAVEMENT TYPE SELECTION PROCEDURES

3.1 Primary Engineering Factors

These factors will be considered and documented in all pavement type selection reports.

3.1.1 Traffic

Both total volume and the percentage of truck traffic should be considered when determining pavement type. The percentage of commercial traffic and frequency of heavy load applications can have a major effect on the structural design of a pavement. For heavily traveled facilities in congested locations, the need to minimize the disruptions and hazards to traffic may dictate the selection of those strategies having long initial service life with little maintenance or rehabilitation regardless of relative economics.

3.1.2 Soils Characteristics

The load-carrying capacity of a native soil is of paramount importance in pavement performance. The characteristics of native soils not only directly affect the pavement structure design but may, in certain cases, dictate the type of pavement economically justified for a given location.

3.1.3 Construction Considerations

Staged construction of the pavement structure may dictate the type of pavement selected. Other considerations such as speed of construction, maintenance of traffic, anticipated future widening and ease of replacement may have a strong influence on pavement type selections in specific cases.

3.1.4 Cost Comparison

Where there are no overriding engineering factors and several alternate pavement types would serve satisfactorily, cost comparison can be used to assist in determining pavement type. Such costs should include the initial construction cost, the cost of subsequent stages or corrective work, anticipated life, maintenance costs and costs to road users during periods of reconstruction or maintenance. It should be noted that should budget constraints warrant, selection of pavement type may be based on initial cost.

3.1.4a Initial Cost Analysis

Initial cost analysis is to be performed on all projects. Unit costs should be obtained from the Engineering Estimating Section in the Division of Highway Design for all projects listed in Section 1.3. For all other projects the average unit bid prices for the previous calendar year may be utilized unless more regionally specific data is available.

3.1.4b Life Cycle Cost Analysis

Life Cycle Cost Analysis is to be performed on all projects where the (1)Traffic, (2)Soils Characteristics, (3)Construction Considerations, or (5)Initial costs between pavement alternates do not overwhelmingly favor a particular alternate. The current KYTC Pavement Design Guide Excel spreadsheet incorporates these computations into the cost analysis for projects designed by District offices and consultant personnel. A more detailed LCCA spreadsheet will used by Central Office Pavement Design staff for all projects on the National Highway System and projects with greater than 20,000,000 ESALs. Life Cycle Cost Analyses will only include agency costs at this time. The life cycle costs for user delay will be analyzed separately.

Analysis Factors

Listed below are the factors that are to be used in all Life Cycle Cost Analysis for KYTC projects.

1. Design Life

All Interstates, Parkways (>15,000 ADT): 40 years
All Other Routes: 20 Years

The design lives listed above are desired. However, there may be instances where the design lives may be shortened due to budgetary constraints or other circumstances (such as staged construction).

2. Analysis Period

An Analysis Period of 40 years will be used for all Life Cycle Cost Analysis.

The analysis period listed above is desired. However, there may be instances where the analysis period may be shortened due to budgetary constraints or other circumstances (such as staged construction).

3. Rehabilitation Cycles and Strategies

All Interstates, Parkways (>15,000 ADT)

Asphalt: Years 10, 20, 30 - Mill 1 ¼" and resurface with 1 ¼" of asphalt.

Concrete: *New, Full-Depth Construction*
Year 15 – Repair 5% of area full-depth and Diamond Grind
Year 30 – Repair 15% of area full-depth and Diamond Grind

Unbonded Overlays
Year 15 – Repair 2% of area full-depth and Diamond Grind
Year 30 – Repair 5% of area full-depth and Diamond Grind

All Other Routes

Asphalt: Year 15 – Mill 1 ¼" and resurface with 1 ¼" of asphalt
Year 30 – Mill 1 ¼" and resurface with 3 ¼" of asphalt

Concrete: Year 25 – Repair 5% of area full-depth and Diamond Grind

4. Agency Costs

Agency costs are defined as the anticipated initial costs and future rehabilitation costs expended by the Kentucky Transportation Cabinet. Agency costs do not include any costs associated with user delay during initial construction or subsequent maintenance activities.

User Costs

User costs will be analyzed for all projects. The procedure from the FHWA-SA-98-079 "Life Cycle Cost Analysis in Pavement Design" publication is to be used to develop these costs. These costs should be analyzed separate from the agency costs when performing Life Cycle Cost Analysis. User Costs will not be included in calculating bid adjustments for bidding purposes.

5. Salvage Value

Salvage value will not be included into the Life Cycle Costs Analysis. For purposes of these analyses the assumption will be that both pavement types will have similar value at the end of the 40-year analysis period.

6. Unit Costs

The Engineering Estimating Section in the Division of Highway Design will provide unit costs for all life cycle cost analysis.

8. Discount Rate

A discount rate of four (4) percent will be used to compare alternates for all life cycle costs analyses.

3.2 Secondary Engineering Factors

These factors should be considered and documented in pavement type selection reports. When all primary factors are found to be equivalent the secondary factors may be referenced for pavement type selection determination.

3.2.1 Performance of Similar Pavement in the Area

Past performance is a valuable guide, provided there is good correlation between conditions and service requirements between the reference pavements and the designs under study. Certain pavements in specific locations have been able to remain in service well beyond their design lives. Certain pavements have been able to function better and have longer lives between rehabilitation cycles.

3.2.2 Adjacent Existing Pavements

Provided there is no radical change in conditions, the choice of paving type on a highway may be influenced by adjacent existing sections which have given adequate service. The resultant continuity of pavement type will also simplify maintenance operations.

3.2.3 District Maintenance Capabilities

The selection of pavement type on a highway should consider input from District Maintenance Staff relative to their experience and ability to service and maintain alternative pavement types.

3.2.4 Incorporation of Experimental Features

In some instances, the performance of new materials or design concepts must be determined by field testing under actual construction, environmental, or traffic conditions. Where the material or concept is adaptable to only one paving type, the incorporation of such experimental features may dictate pavement type selection.

3.2.5 Stimulation of Competition

It is desirable that improvement in products and methods be encouraged through continued and healthy competition among industries. Where alternative pavement designs have comparable costs and there are no overriding engineering factors favoring one alternate, the Cabinet may elect to take alternate bids. In general, comparable costs are defined as initial and life cycle costs for the agency within ten (10) percent or where the proposed bid adjustment is less than five (5) percent of the total project cost. However, circumstances may exist where the Department of Highways may choose to allow for alternate bids where costs may exceed these percentages. This exception may be allowed with the approval of

the Commissioner of Highways where granting this exception is expected to improve competition and benefit the Department of Highways.

3.3 Alternate Pavement Bidding

There may be certain projects where the primary and secondary engineering factors are determined to be equivalent for both pavement types. In these instances the use of alternate pavement bidding may be considered.

3.3.1 Alternate Pavement Bid Adjustments

When alternate pavement bidding is used to determine pavement type a bid adjustment will be used in the bidding process to determine the successful bidder. The bid adjustment value will be determined based on the future agency costs as calculated in the Life Cycle Cost Analysis. The actual value will be the net present value of the future agency costs calculated based on a 4% discount rate.

The actual bidding procedure will add the bid adjustment value for either the asphalt or the concrete alternate to the bid of the contractor bidding the respective alternate. The bid adjustment value will only be used to determine the low bidder and will not be used to determine final payment to the contractor.

The following formulas will be used for alternate bidding:

Total Bid (Concrete Bidder) = $A + C_{concrete}$

Total Bid (Asphalt Bidder) = $A + C_{asphalt}$

where,

A = The dollar amount for all work to be performed under the contract

C = The Bid Adjustment Value for the respective pavement alternate

3.3.2 Project Completion Time (“B” Component)

When alternate bidding is used on a project and the user costs during initial construction are calculated to be greater than $2,000,000 for either alternate a time component may be added for bidding purposes. The “B” component will be added to allow contractors to bid the number of calendar days necessary to complete all work associated with a project. The value of the “B” component will be calculated using the procedures outlined in FHWA-SA-98-079 “Life Cycle Cost Analysis in Pavement Design”. The daily work zone costs should be determined based on the maintenance of traffic strategy specified in the plans or proposal.

The following formula will be used for alternate bidding with a time component:

Total Bid = A + B + C

where,

A = The dollar amount for all work to be performed under the contract

B = The number of calendar days necessary to complete all work
(The number of days will be multiplied by the daily user cost)

C = The Bid Adjustment Value for the respective pavement alternate

APPROVED _____

Marc Williams, P.E. Date
Commissioner of Highways

APPROVED _____

Jose Sepulveda, P.E. Date
Kentucky Division Administrator, FHWA